tion of stannous chloride, it is quickly surrounded with an outgrowth of prolonged octohedra, and as these advance into the liquid it is easy to observe that the additions of new metal commence at the apex, and that the wave of chemical change proceeds down the lateral edge, occupying some seconds of time in depositing the new layer of material. Frequently, also, there is a luxuriant growth of large flat leaflets, or of symmetrical structures resembling fern-leaves, but with the fronds arranged at right angles, or combinations of these with octohedra, as shown in Fig. 6. These fern-leaves often begin of a dull grey colour; but, as they advance, suddenly change to a brilliant white.

The particular form of these crystalline growths depends, therefore, primarily, on the specific character of the metal; but this is greatly modified by the strength of the solution.

The forms assumed by native metals resemble those produced by this process of substitution. In some cases, indeed, it seems almost certain that the deposition of these minerals was effected in the same way, as, for instance, the silver which occurs sometimes in tufts, sometimes in large crystals, on the native copper of the Lake Superior district. Gold is frequently found in cubes more or less rolled, but the leaf gold from Transylvania bears a striking likeness to the crystals that form in our laboratory experiments. Silver is often found native as twisted hairs or wires of metal—a form that never occurs in the decomposition of its nitrate by copper, but which can be artificially produced in another way.

There has been noticed a singular tendency in old silver ornaments and coins to become crystalline and friable. Here is an ancient fibula from the island of Cyprus, supposed to be at least 1,500 years old, which, through the greater portion of its substance, presents a fracture something like that of cast-iron, and its specific gravity has been reduced in round numbers from 10 to 9. It contains a little copper. This property of certain metals or their alloys to change in condition and volume, is worthy the attention of those whose duty it is to make our standards. Experiments should be instituted for the purpose of learning what metals or combinations of metals are least subject to this secular change.

These metallic crystals are Nature's first attempt at building. This material is the simplest possible—in fact, what chemists look upon as elementary. But how is the building carried on? What are the tools employed? Where are the bearers of burdens that bring the prepared pieces and lay them together according to the plan of the Great Architect? We must try to imagine what is taking place in the transparent solution. The silver, of course, existed at first in combination with the nitric element, and for every particle of silver deposited on the growing tree, an equivalent particle of copper is dissolved from the surface of the plate. The nitric element never ceases to be in combination with a metal, but is transferred from the one metal to the other. On the "Polarisation Theory," the positive and negative elements of the salt constantly change places and enter into fresh combinations, one consequence of which would be a gradual passage of the nitric element from the growing silver to the copper plate. This actually takes place, and there is a diminution of the salt at the ends of the silver branches, giving rise to an upward current, and a condensation of nitrate of copper against the copper plate, which gives rise to a strong downward current. These two currents are seen in every reaction of this nature. In the case of silver and copper, however, it has been proved that the crowding of the salt towards the copper plate is more rapid than would follow from the usual polarisation theory. The instrument employed for determining this point was a divided cell in which two plates, one of silver and the other of copper, connected together by a wire, are immersed each in a solution of its own nitrate, contained in each division of the cell, and separated from one another merely by parchment paper. The crystals of silver deposited on the silver plate in this experiment are very brilliant.

There are other indications of the liquid being put into a special condition by the presence of the two metals which touch one another. Thus zinc alone is incapable of decomposing pure water; but if copper or platinum be deposited on the zinc in such a manner that the water can have free access to the junction of the two metals, a decomposition is effected; oxide of zinc is formed, and hydrogen gas is evolved. At the ordinary temperature the bubbles of gas rise slowly through the liquid, but if the whole be placed in a flask and heated pure hydrogen is given off in large quantity. We have also found that iron or lead similarly brought into intimate union with a more electro-negative metal, and well washed, will decompose pure water.

As might be expected, the action of magnesium on water may be greatly enhanced by this method; and a pretty and instructive experiment may be made by placing a coil of magnesium in pure water at the ordinary temperature, when there will be scarcely any effect visible, and then adding a solution of sulphate of copper. The magnesium is instantly covered with a growth of the other metal, and at the same time the liquid seems to boil with the rapid evolution of hydrogen bubbles from the decomposed water.

When, however, the force of the two metals in contact has to traverse a layer of water, the resistance offered by the fluid prevents its decomposition. This must also be an important element in the decomposition of a metallic salt dissolved in water, and in fact we have found that the addition of some neutral salt, such as nitrate of potassium, increases the action—apparently by diminishing the resistance of the liquid. If, too, we increase the quantity of the dissolved metallic salt, we get more than a proportional increase of deposited metal. Thus, in an experiment made with the different strengths of nitrate of silver on the table, the following results were obtained in ten minutes, all the circumstances being the same except the strength of the solution:—

1 per cent.	solution dissolved	·025	grm. copper.
2 „	„ „	·078	„
4 „	„ „	·224	„

In fact it has been found that in solutions not exceeding 5 per cent., twice the amount of nitrate of silver dissolved in water gives three times the amount of chemical action; and this is true with other metals also in weak solution. It may be that this is not the precise expression of a physical law, but it agrees at least very closely with the results of experiment.

The power arising from this action of two metals on a binary liquid may be carried to a distance and produce similar decompositions there. This is ordinary electrolysis. Metals have often been crystallised from their solutions in this way, and Mr. Braham has made excellent preparations of crystalline silver, gold, copper, tin, platinum, &c., by using poles of the same metal as that intended to be deposited upon them. The forms thus obtained are precisely analogous to those produced by the simple immersion of one metal into the soluble salt of another, and illustrate still further the essential unity of the force that originates the two classes of phenomena.

NOTES

THE speech of the Prime Minister at the meeting held last week in support of the fund to pay off the debt at King's College was a striking comment on some recent utterances of members of the Government to the effect that Science is well able to support itself, and needs no assistance from the State. The claims of this fund on public assistance were earnestly and eloquently urged on the ground that King's College was an institution founded to promote the union between Science and Religion, and therefore the happiness of mankind. In the course of the meeting it was mentioned that the works connected with the Thames Embankment have entirely destroyed the dining-hall of the College, entailing a loss of 1,400*l.* or 1,500*l.*, for which no legal redress can be obtained; and this although noble dukes receive compensation to the extent of thousands of pounds for the injury inflicted on the privacy of their gardens by the same works.

On the occasion of the annual conferring of degrees by the University of London on the 15th inst., Mr. Lowe, who is a member of the Senate of the University and its representative in Parliament, expressed an opinion in favour of making Greek an optional subject at the Matriculation Examination, to be substituted either by an additional modern language, or by some branch of natural or physical science. The proposed change has now been before the body of graduates for the last two years, but has not yet received the sanction of Convocation. At the last meeting, on the 14th inst., the subject was referred back to the Annual Committee of Convocation for further consideration. In the course of the same speech, Mr. Lowe urged benefactors of education to leave money for the endowment of scholarships at the University, rather than of professorial chairs, on the ground that the pay of lecturers ought to be in proportion to the amount of instruction they give, *i.e.* to the number of their pupils. Mr. Lowe appears, however, to forget that quality, as well as quantity, is required in teaching, and that this quality can only be secured by original work, to devote himself to which the professor must be to a certain extent independent of the emoluments derived from actual teaching.

The special correspondent of the *Daily News*, writing from Zanzibar under date of April 19, states that no letters had been received there from either Dr. Livingstone or Mr. Stanley up to that date, and that war was still going on in Unyanyembe between the Arabs and the natives. The terrible hurricane of the 13th had wrecked every vessel in the harbour of Zanzibar except the *Abydos*; the harbour was then one mass of wreck, and European residents expect that a famine may be the result, the cocoa-nut and clove-trees, the chief products of the island, having been almost entirely destroyed, and that trade will be brought to a standstill for some time. Mr. Horace Waller forwards to the *Times* a letter just received from Mr. Oswell Livingstone, in which he speaks of the expedition being detained in Zanzibar by the hurricane up to April 20; and Prof. Corfield sends one to the same journal from Dr. James Christie, physician to the Sultan of Zanzibar, who says that he believes Dr. Livingstone is alive and well, and that Mr. Stanley has relieved him at Ujiji, and that he would not be surprised to meet them both in Zanzibar any day.

We are very glad to be able to announce that the United States Senate has unanimously passed a bill, appropriating 50,000 dols. to meet the expenses of the observations upon the transit of Venus in 1874, on the part of the National Observatory in Washington. The bill has been introduced into the Lower House, and will doubtless soon become a law.

Prof. Palmieri of Naples has received an address, signed by seventy citizens of Rome, expressing their admiration of his character and conduct, and congratulating him on the success of his efforts to save numerous victims from destruction in the late terrible eruption of Vesuvius. A communication from Rome states that he is to be nominated a senator of the Kingdom of Italy.

The Royal Danish Society of Copenhagen offers the following prizes for competition during the ensuing year:—For a description of the spectra of the planets Venus, Mars, Jupiter, Saturn, and Uranus, which shall determine the question relating to the position and special nature of the principal lines, accompanied by a critical comparison of the results previously obtained by Huggins, Secchi, Vogel, and, as respects Jupiter, by Le Sueur, of Melbourne—the gold medal of the Society, together with a sum of money of fifty Danish ducats (450 frs.). For a thorough research into the organic reproduction of one of the groups of setiferous Annelidæ, the Naididæ, Scyllidæ, or Serpulidæ, especially with relation to the question whether the same individuals are both gemmiferous and sexual, or whether the sexual and organic modes of reproduction are strictly separated in different individuals and generations, accompanied by the necessary drawings—the gold medal of the Society. The essays may be written in Latin, French, English, German, Swedish, or Danish; and must be addressed before the end of October 1873 to the secretary of the society, M. J. J. S. Steenstrup.

Some little time ago we noticed in our columns an effort that was being made to raise a memorial to the late Sir R. Rede, the founder of the Rede Lecture at Cambridge, and we are glad to be able to state that in consequence several fresh subscribers have added their names to the list, so that the fund now amounts to 80*l.*, which is exactly one half of the sum required for the window that it is proposed to fill with stained glass in the church where the remains of this far-seeing friend to knowledge rest. The Rede Lecture is to be delivered in the Senate House, Cambridge, on Friday, 24th inst., by Mr. Edward H. Freeman, D.C.L., on the Unity of History, and it is hoped that members of the University, as well as others interested in the promotion of science, will contribute towards the completion of the memorial of which a partial commencement has been made by inserting a portion of the glass. The Rev. Professor Selwyn, D.D., has kindly consented to receive subscriptions at Mortlock's Bank, Cambridge, "Rede Memorial Fund;" and Mr. Norman Lockyer, F.R.S., the late Rede lecturer, in London, at 6, Old Palace Yard, Westminster. The names of the subscribers will be found in our advertising columns.

We have to record with great satisfaction the appointment of Mr. M. J. Barrington Ward, B.A., F.L.S., to be one of Her Majesty's Inspectors of Schools. Mr. Barrington Ward was a scholar of Magdalene Hall, and first of his year in Natural Science at Oxford. He has recently occupied the post of Science-master at Clifton College.

The post of teacher of Chemistry at Clifton College will be vacant at the end of the present term.

Among recent deaths of persons eminent in Science, *Harper's Weekly* mentions that of Dr. Samuel Jackson, former Professor of the Institutes of Medicine of the University of Pennsylvania, which took place at Philadelphia on the 5th of April last. Dr. Jackson was born in Philadelphia in 1787, and was therefore eighty-five years of age. He held the position of active professor for twenty-eight years, and retired in 1863. He was well known as a physician and surgeon of great eminence, and for a long time occupied a leading position. He was also an author of some celebrity, and popular as a lecturer. His most important work was "The Principles of Medicine," first published in 1832, and which has gone through numerous editions.

A communication was presented to the National Academy of Sciences at Washington, at its annual meeting, on April 16 last, from Prof. Agassiz, dated Monte Video, February 26. In this he expresses his gratification at finding evident traces of glacial action in the vicinity of Monte Video, as shown by the occurrence of phenomena which were quite satisfactory to his mind. He leaves the question undecided as to the origin of the erratic boulders found scattered over the surface, but hopes that his further investigation in the southern hemisphere will enable him to supply the necessary data.

PROF. CORFIELD will commence a course of twelve lectures on Hygiene and Public Health at University College, London, on Tuesday next, at 12 o'clock.

AT the last exhibition of the Royal Horticultural Society an interesting feature was introduced in the shape of prizes offered for the best dinner-table decorations. The competing tables were laid out in two tents in the gardens, and were an object of great attraction. Many of them were remarkable for the taste displayed in the arrragements.

A FUND was started some time ago to promote the investigation of the Wealden formation of Sussex, especially with reference to the question of the supposed underlying coal strata. Large subscriptions have already been received for this purpose; the Duke of Devonshire has promised 250*l.*, and Lord Leconfield 100*l.* It is believed by many geologists that coal in large quantities may occur in strata beneath some of the longitudinal folds of the Wealden denudation, and form a continuation of the Belgian coal beds.

THE Ethnological Collection of the Oxford Museum has lately been enriched by the presentation to it of some North Australian spears, by Captain Halpin, of the *Great Eastern.* Captain Halpin, in his capacity as chief of the Expedition which laid the cable to Australia last year, visited Port Darwin, and there obtained these weapons. One of the spears has a stone head. The stone of which it is formed is a sort of shale. The head is large, very sharp, and of the unground type. The Oxford Ethnological series is, under the hands of Prof. Rolleston, becoming a very valuable and complete one indeed, and those who are in possession of authentic crania or weapons of interest from an ethnological view, cannot do better than contribute to it. Canon Greenwell has lately presented the whole of his valuable collection.

THE *American Naturalist* is responsible for the following story, which we could hardly have credited except on such authority:—"Central Park Museum.—Destruction of Mr. Hawkins' Restorations.—A *Times* reporter called yesterday on Mr. B. Waterhouse Hawkins in order to ascertain the truth of the allegations made in a communication which appeared in yesterday's *Times* in reference to the destruction of his restorations in the Central Park Museum. Mr. Hawkins stated that all he had done during twenty-one months to restore the skeletons of the extinct animals of America (of the *Hadrosaurus,* and the other gigantic animal, which was thirty-nine feet long), was destroyed by order of Mr. Henry Hilton, on the 3rd of May last, with sledge-hammer, and carted away to Mount St. Vincent, where the remains were buried several feet below the surface. The preparatory sketches of other animals, including a mammoth and a mastodon, and the moulds and sketch models, were destroyed. Mr. Hilton did this, said Mr. Hawkins, out of ignorance, just as he had a coat of white paint put on the skeleton of a whale which Mr. Peter Cooper had presented to the Museum, and just as he had a bronze statue painted white. Mr. Hilton told the celebrated naturalist who had come from England to undertake the work, that he should not bother himself with 'dead animals,' that there was plenty to do among the living. When the skeletons were dug up again, by order of Col. Stebbins, they were found broken in thousands of pieces. Prof. Henry, of the Smithsonian Institution, when he heard of this piece of barbarism, would not believe it. 'Why,' he exclaimed, 'I would have paid them a good price for it.' Mr. Hilton, however, preferred to destroy the work of the naturalist which had cost the City at least twelve thousand dollars." The proceeding appears to have met with universal reprobation from the Americans. The *Naturalist* refers by way of contrast to the record in our columns of the preservation of the great megalithic monument at Avebury, through the public spirit of Sir John Lubbock.

THE poorest flora in the world is probably that of the island of St. Paul in the Indian Ocean, an account of which appears in the "Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien" for 1871. It consists, as far as flowering plants are concerned, of six grasses, a sedge, a *Plantago,* and a *Sagina.* Of these the two latter only are undescribed species, and all the remainder have probably been introduced.

THE Acclimatisation Society of Auckland, New Zealand, has printed its fifth Annual Report. The efforts of the Society during the preceding year have been chiefly devoted to the introduction of insectivorous birds from England and Australia, and of freshwater fish. In both these respects the Society has met with greater success than in previous years, and appears to be performing work of great service to the colony. The gardens of the Society have also been considerably enlarged.

SEVEN parts are now published of the new edition of Griffith and Henfrey's Micrographic Dictionary, edited by Dr. Griffith, the Rev. M. J. Berkeley, and Prof. T. Rupert Jones, of which we have already noticed the issue of the first number. They bring down the articles as far as *Confervoideæ.*

DR. CHARLES C. ABBOTT has reprinted his elaborate and profusely-illustrated article on the "Stone Age of New Jersey," which has been running through several numbers of the *American Naturalist.*

THE Danish war steamer *Fylla* has been ordered by the Danish Government to take soundings and survey landing-places for the submarine telegraph line intended to connect Scotland with Canada *viâ* the Faroe Islands. It is to be hoped that these soundings will be accompanied by dredgings, and that they will be carefully made, as much of Dr. Carpenter's early researches in deep-sea dredging, which excited so much attention at the time and since, were made in the neighbourhood of the Faroe Islands.

THE earthquake in California on March 26 appears to have been felt over a very large area, and in some places to have been very severe. At Leone Pine, in the country north of the Mojane river, twenty-three people were killed, and thirty wounded; fifty large houses were destroyed, and the town is in ruins. Similarly Camp Independence, Inigo county, is in complete ruins, the earthquake having been most severe in that region. Large fissures are reported, miles in length, and 50 to 200 feet wide, and twenty feet deep, opened along the eastern base of the Sierra Nevada, near Big Pine Camp. At other places in the vicinity, the ground is heaved up in great ridges; large springs have stopped running, and others have broken out. Heavy snow slides have occurred in the Sierras, and large rocks rolled down the mountain side, blocking up the road. The shocks lasted at intervals from 2.20 to 6.30 A.M. Many people at Camp Independence were hurt, but none were killed. The shock was probably the heaviest south-eastward towards Arizona, in the desert country which has hardly any population.

THE April number of the *American Journal of Science* contains an account by Prof. Marsh, the indefatigable palæontologist, of his discovery of a new species of *Hadrosaurus,* a giant lizard; one of which, found in New Jersey, from its enormous size, constitutes one of the chief attractions of the Academy of Sciences of Philadelphia, where it is deposited. The present animal is scarcely one-third the size of the New Jersey specimen. It was discovered near the Smoky Hill River, in Western Kansas, and is named *Hadrosaurus agilis.*